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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,263	02/09/2004	Akira Ito	1875.2590001	8570

7590 11/26/2004  
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EXAMINER

DOLAN, JENNIFER M

ART UNIT PAPER NUMBER

2813

DATE MAILED: 11/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/773,263	<b>Applicant(s)</b> ITO ET AL.	
	<b>Examiner</b> Jennifer M. Dolan	<b>Art Unit</b> 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 07 September 2004.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>8/16/04</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,163,180 to Eltoukhy et al. (cited by applicant).

Regarding claim 1, Eltoukhy discloses a method of programming an anti-fuse device, comprising: forming a channel (figure 3, area under 16a) between a source region (26) laterally spaced from a drain region (28a) in a substrate (12); forming a gate oxide (14; figure 3) on the channel; forming a gate (16) on the gate oxide (also see column 4, lines 25-65); forming lightly doped source and drain extension regions (18a and 20a; alternatively 18b and 20b) in the channel that cumulatively occupy more than half of the channel (figure 3); and programming the anti-fuse device through application of power to the gate and one of the source or drain regions to break down the oxide and minimize resistance (column 2, lines 1-8; column 3, lines 37-55; column 5, lines 26-68).

Regarding claim 2, Eltoukhy discloses that the substrate is lightly P doped (column 4, lines 29-33; figures 1-4).

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Regarding claims 3 and 4, Eltoukhy discloses doping the source and drain regions as well as the source and drain extension regions with N-type material (column 4, line 62 – column 5, line 15).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 5, 6, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eltoukhy et al. in view of U.S. Patent No. 6,515,931 to Marr et al. (cited by applicant)

Regarding claims 5 and 6, Eltoukhy fails to disclose that the source, drain, and extension regions are p-type.

Marr discloses that an anti-fuse device can equivalently be formed using N-type source/drain regions and P-type source/drain regions (figures 1-2; column 3, lines 25-41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the anti-fuse device fabrication method of Eltoukhy, such that the source, drain, and extension regions are doped with P-type material, as suggested by Marr. The rationale is as follows: A person having ordinary skill in the art would have been motivated to P-type source, drain, and extension regions, because NMOS and PMOS anti-fuse devices are recognized as analogous and equivalent in the art (see Marr, column 3, lines 25-41), and it is well within the

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purview of a person having ordinary skill in the art to reverse the polarities of the doped regions of the device (i.e. to select either an NMOS or a PMOS device (also see Marr, figures 1 and 2).

Regarding claim 9, Eltoukhy discloses doping the substrate with a P-type material (figures 1-4), but fails to disclose forming the source and drain regions in an N-well region formed in the substrate.

Marr disclose an anti-fuse in which the source and drain regions (16 and 18) are formed in an N-well layer (12) doped into a P-type substrate (14; figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the anti-fuse of Eltoukhy, such that the device is formed in an N-well, as taught by Marr. The rationale is as follows: A person having ordinary skill in the art would have been motivated to provide the device in an N-well, because doing so prevents the formation of parasitic diodes between any regions of the anti-fuse device (Marr, column 4, lines 32-43). Also, placing the device in an N-well allows the anti-fuse to be compatible with any polarity or doping strength of the substrate, which makes it viable for CMOS fabrication, as is appreciated by one skilled in the art.

5. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eltoukhy et al in view of U.S. Patent No. 6,326,651 to Manabe (cited by applicant).

Eltoukhy fails to disclose a deep N-well region or a deep P-well region formed within the substrate beneath the source, drain, and channel region.

Manabe discloses a deep N-well region (109) and a deep P-well region (111) formed within the substrate (100) beneath the source, drain, and channel regions (figure 4) of their respective MOS transistors in the CMOS device.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the anti-fuse structure of Eltoukhy, such that a deep N-well or a deep P-well is formed within the substrate beneath the source, drain, and channel regions, as taught by Manabe. The rationale is as follows: A person having ordinary skill in the art would have been motivated to provide a deep N-well or P-well, so that it can act as a channel stopper region, to define the size and spread of the MOS channel (see Manabe, column 7, lines 1-11).

#### ***Allowable Subject Matter***

6. Claim 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Response to Arguments***

7. Applicant's arguments filed 9/7/04 have been fully considered but they are not persuasive.

The applicant argues that the antifuse disclosed by Eltoukhy has been programmed, and thus does not meet the requirements that the doped source and drain extensions occupy over half of the channel before programming.

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The examiner disagrees with this assessment of Eltoukhy. In figure 3, both antifuses 10a and 10b are shown to be identical members of an array (column 8, lines 25-51), with the source and drain extensions occupying about two-thirds of the channel for both antifuses 10a and 10b. Since Eltoukhy further states that in figure 3, antifuse 10a has been programmed, and antifuse 10b has not been programmed (column 8, lines 48-51), it is apparent that in Eltoukhy that the antifuses have source and drain extension regions occupying over half of the channel before programming (see antifuse 10b in figure 3), and then are programmed as claimed (see 10a in figure 3).

### ***Conclusion***

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan  
Examiner  
Art Unit 2813

jmd

  
CARL WHITEHEAD, JR.  
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